

Human Recognition

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12/3/2021



Motion Detection + Human Recognition



Maximum Occupancy - How to Do Crowd Counting?



A Neural Network Model to
recognize whether an image
contains human

Data Pipeline

Data Collection

Downloaded from
Kaggle:

- Three datasets of human recognition
- Waste dataset
- Furniture dataset
- Animals dataset

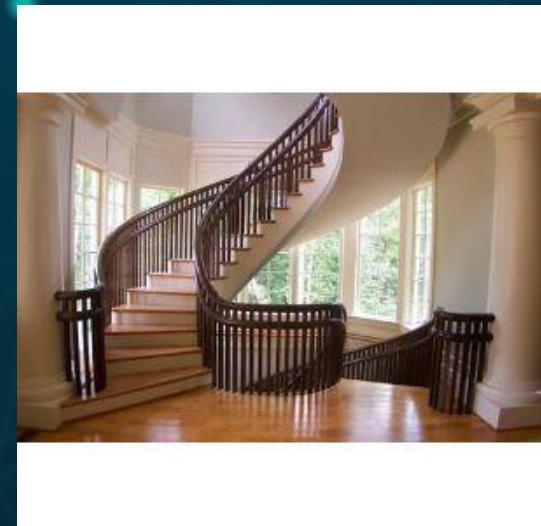


Mix and Clean

Total 7,424 images:

- 3,712 images with human
- 3,712 images without human

Samples of Images without Human



Samples of Images with Human



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Data Splitting

- Training: 4,352 images (58.62%)
- Validation: 1,536 images (20.69%)
- Testing: 1,536 images (20.69%)

Baseline Model

Random Forest Classifier

- Training: 99.98% accuracy
- Validation: 80.53% accuracy

Neural Network Modeling

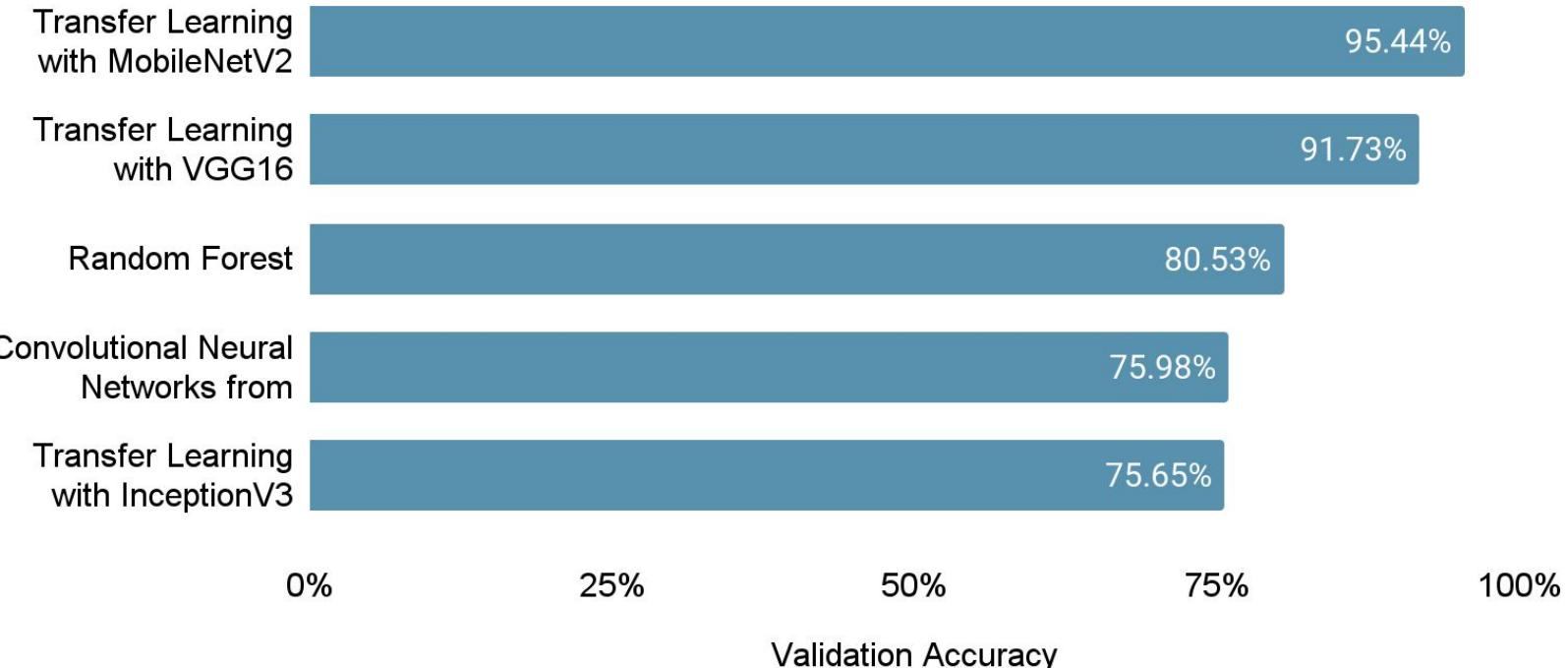
Use Google Colab:

- Convolutional Neural Network
- Transfer Learning
 - MobileNetV2
 - VGG16
 - InceptionV3
- Tuning layers and neurons

Preprocessing

- ImageDataGenerator
- Image Augmentation

Model Comparison



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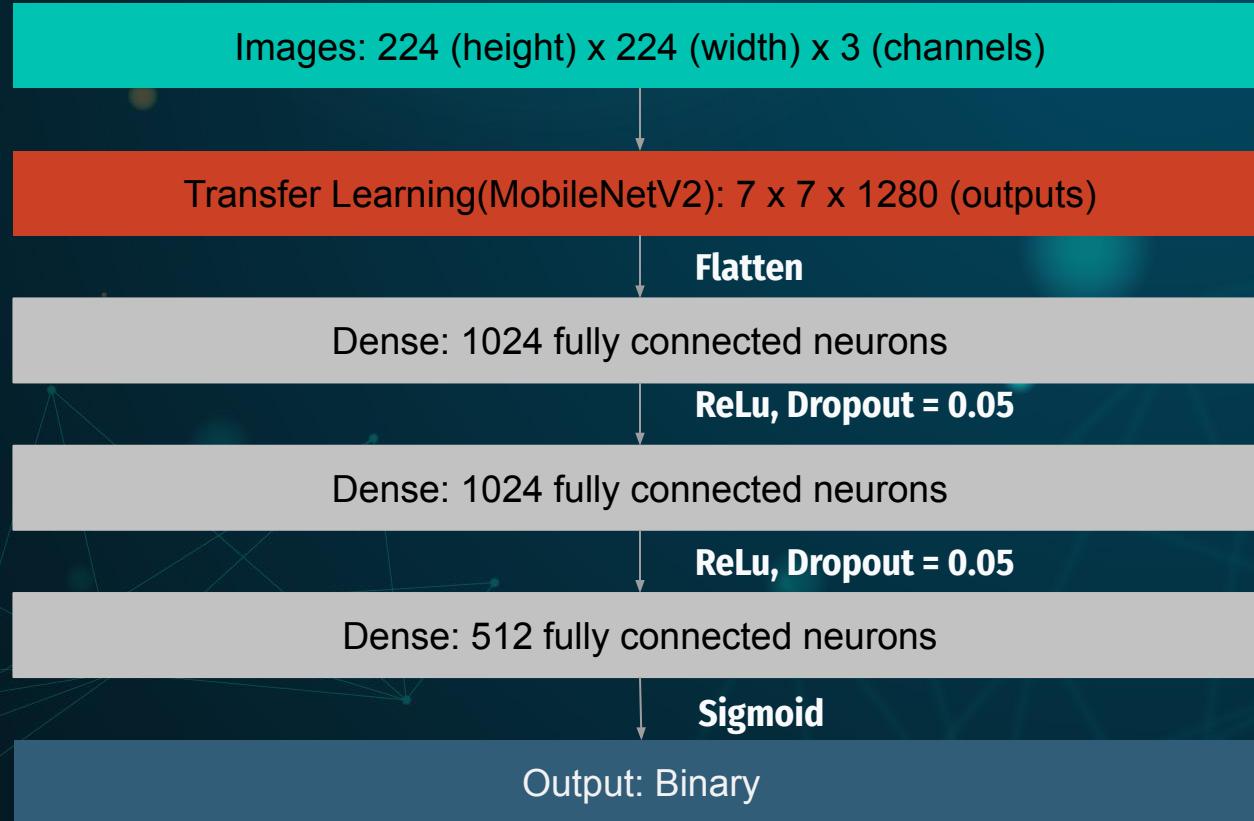
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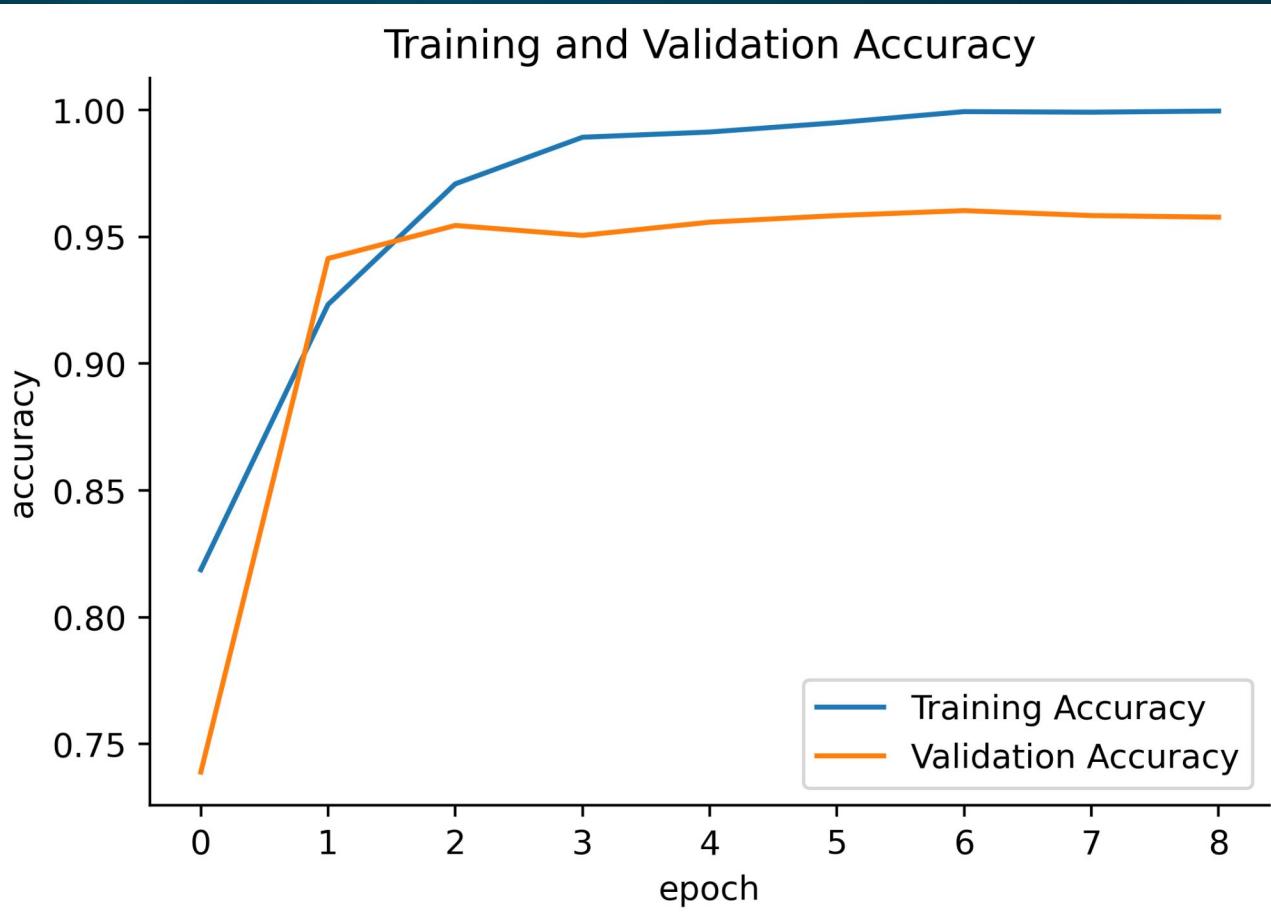
Evaluation

- Test data
- Security camera captures
- Images of crowd in a mall

Architecture



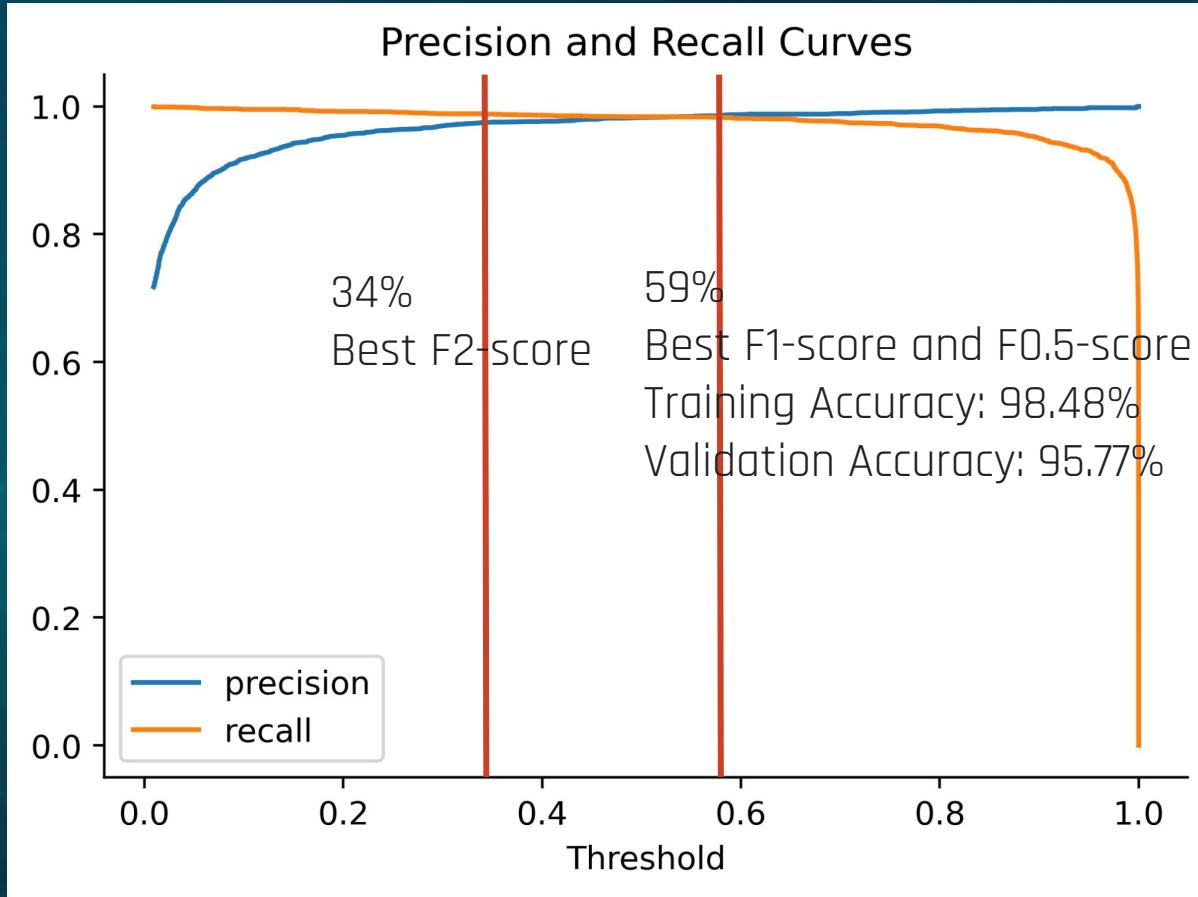
Training History - Early Stop at Epoch 8



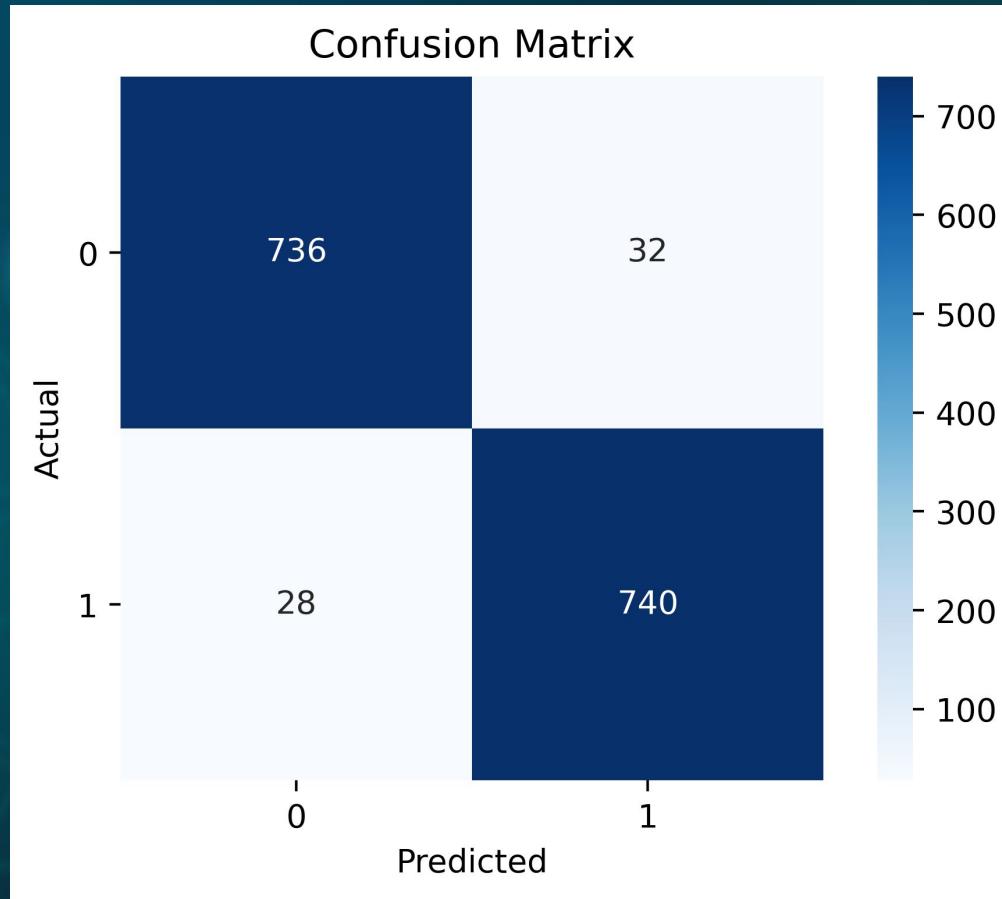
Training Accuracy: 98.21%

Validation Accuracy: 95.44%

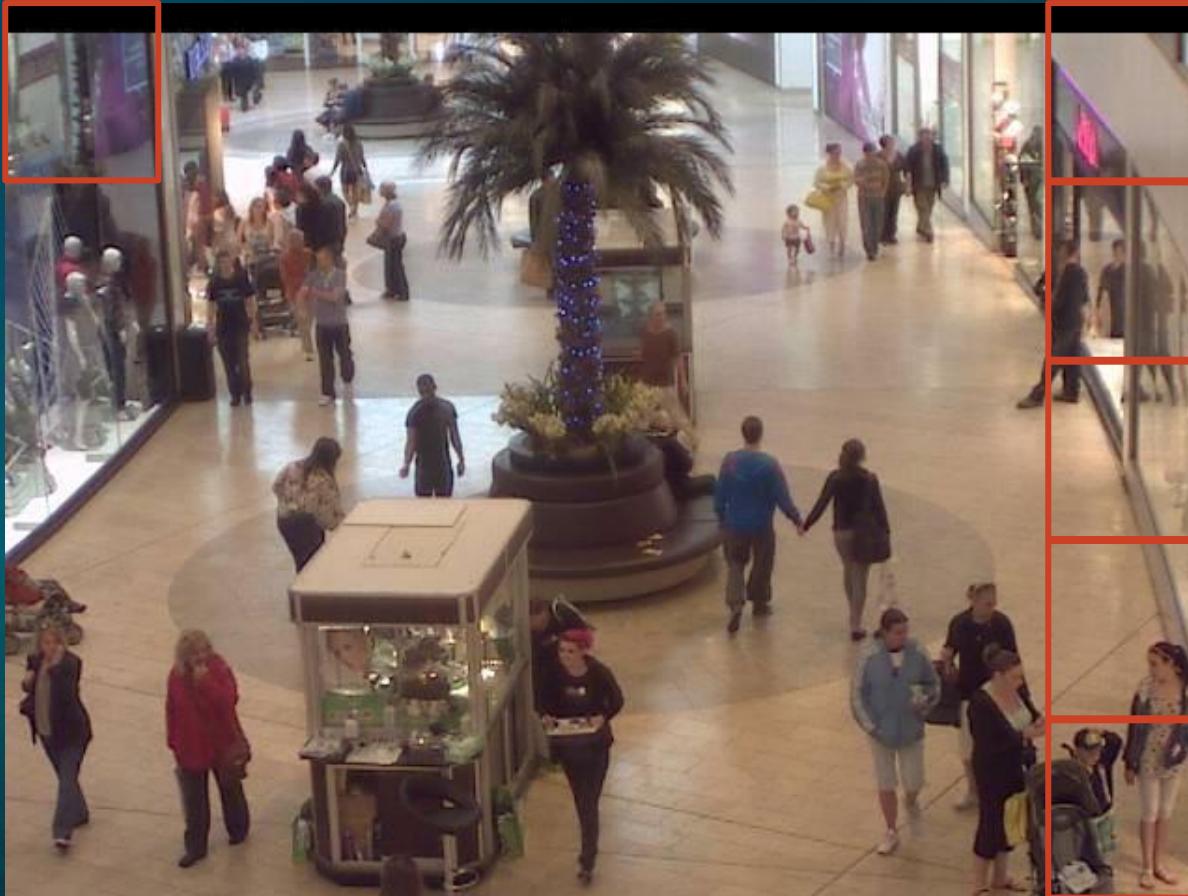
Model Evaluation



Test Result with 59% Threshold- Accuracy 96.09%



Crowd Counting



Mean = 31.16
MAE = 6.30



Security Camera with 34% Threshold- Recall 85.71%

Predicted Without Human



Actual
Without
Human

Predicted With Human



Actual
With
Human



Conclusion

- Good accuracy with original data
- Still need to improve
 - Different sizes
 - Different angles
 - Night vision

Future Work

- Collect more images
- Try more image augmentation
- Try more transfer learning models
- Try YOLO with OpenCV

THANK YOU!

Do you have any questions?

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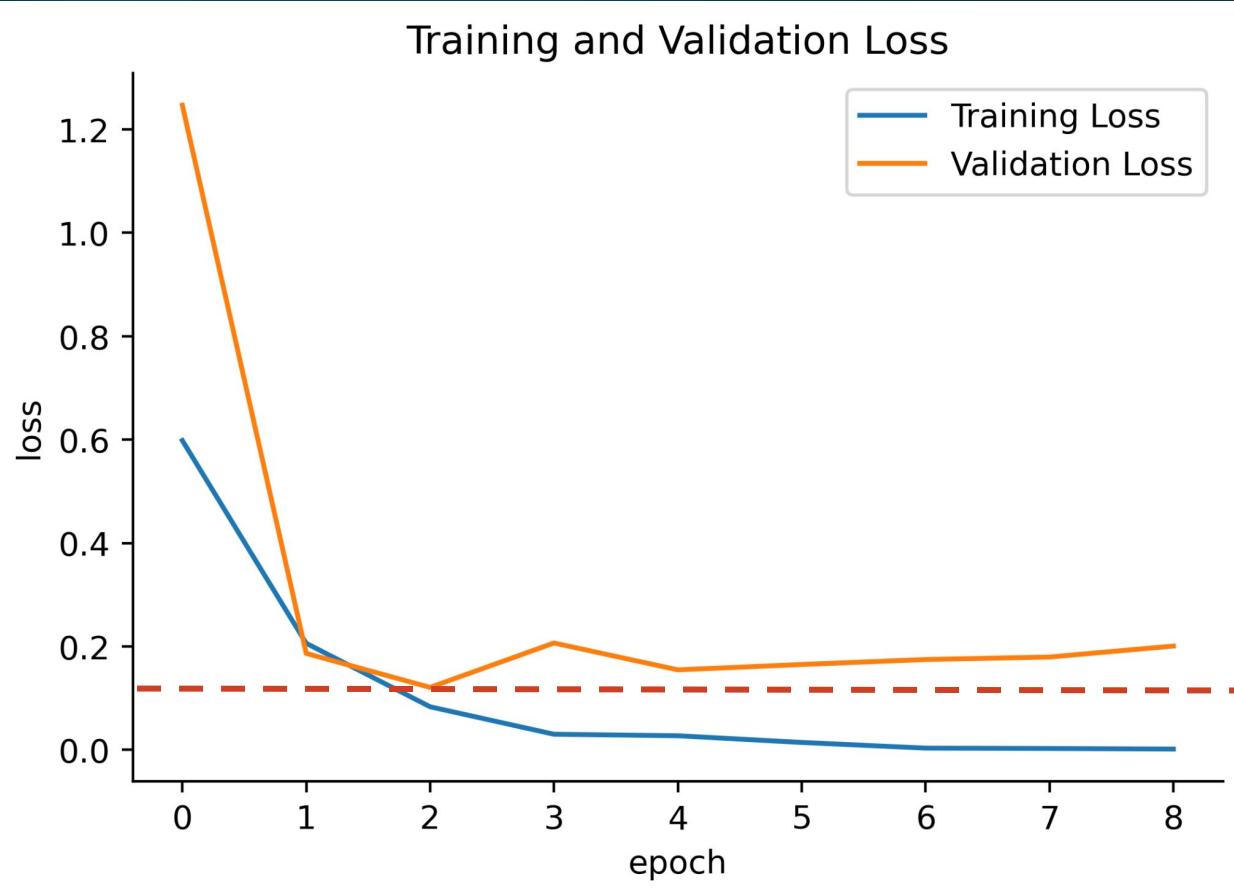
Appendix



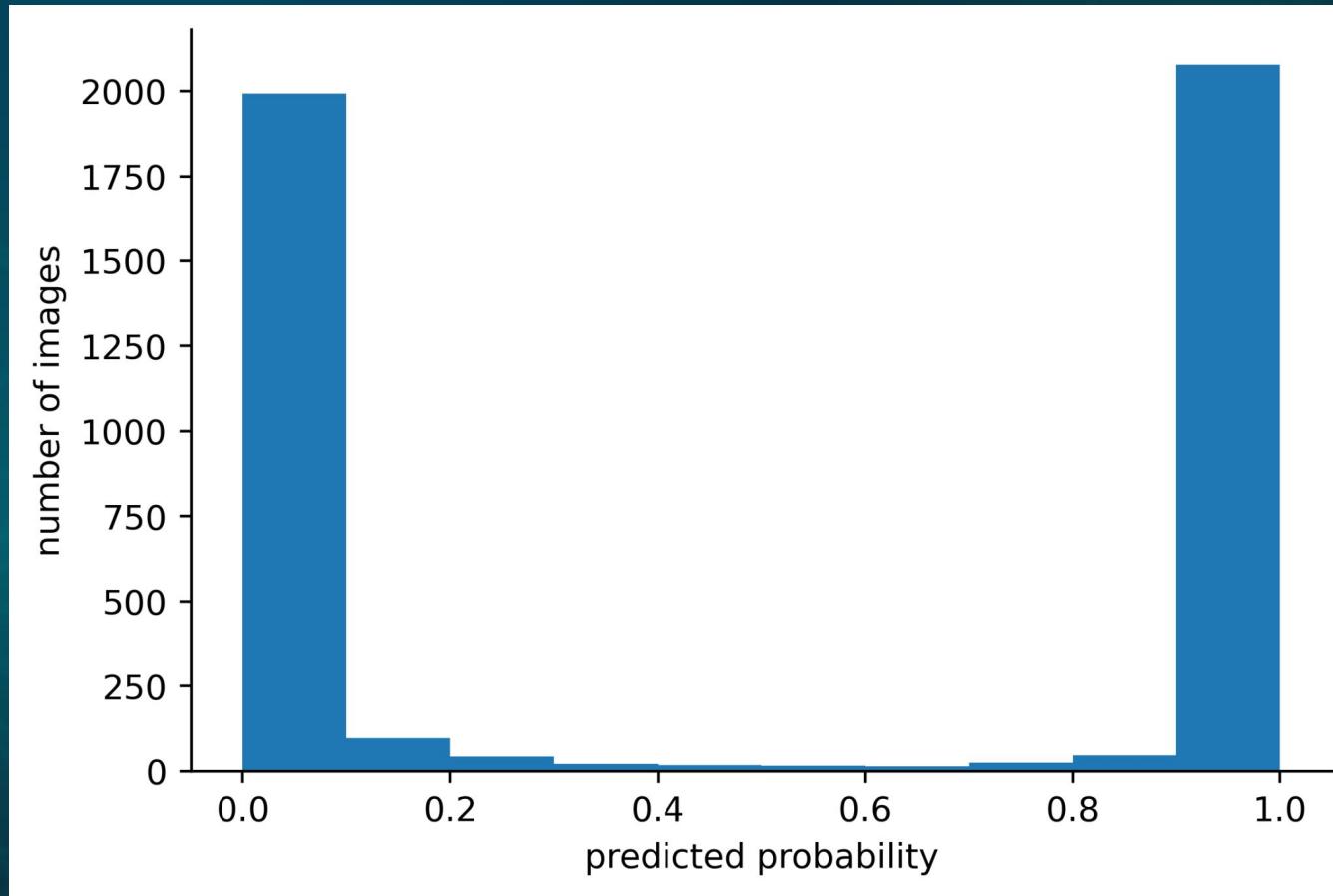
Resources

- Human Activity Dataset
 - <https://www.kaggle.com/jithinnambiarj/human-activity-detection-data-set>
- Human Recognition Dataset
 - <https://www.kaggle.com/siddhrath/human-or-thing-classifier>
- Human Detection Dataset
 - <https://www.kaggle.com/constantinwerner/human-detection-dataset>
- Garbage classification dataset
 - <https://www.kaggle.com/asdasdasdas/garbage-classification>
- Furniture dataset
 - <https://www.kaggle.com/lasaljaywardena/furniture-images-dataset>
- 10 animals dataset
 - <https://www.kaggle.com/alessiocorrado99/animals10>

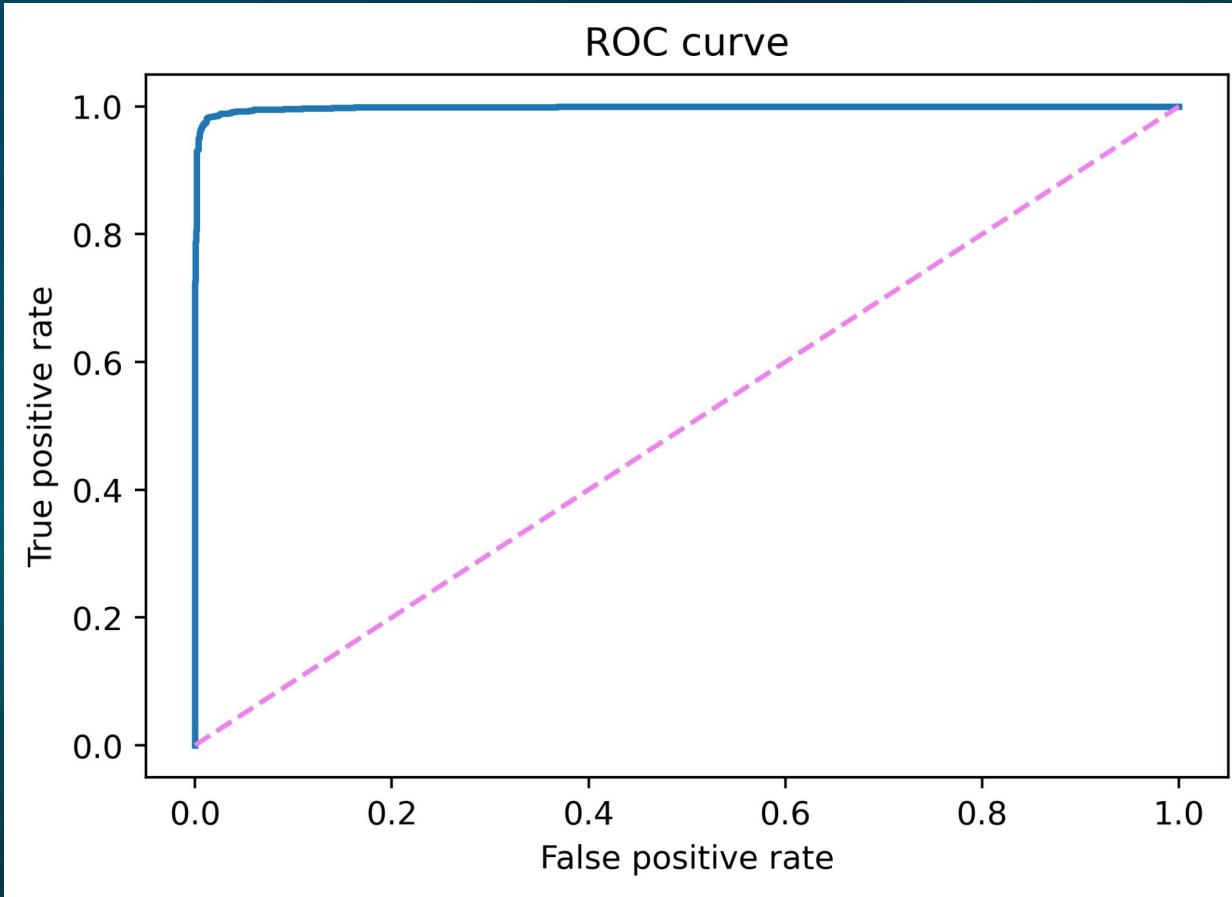
Training History - Loss



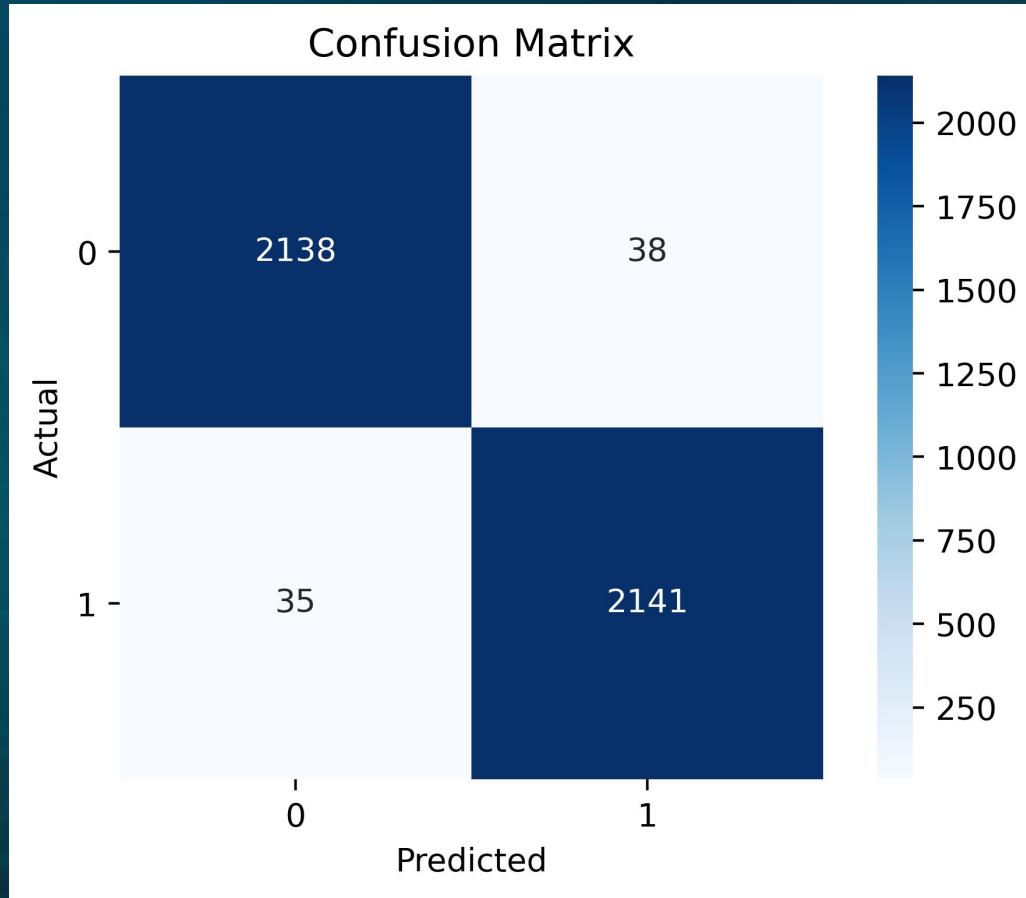
Predicted Probability Histogram of Training Data



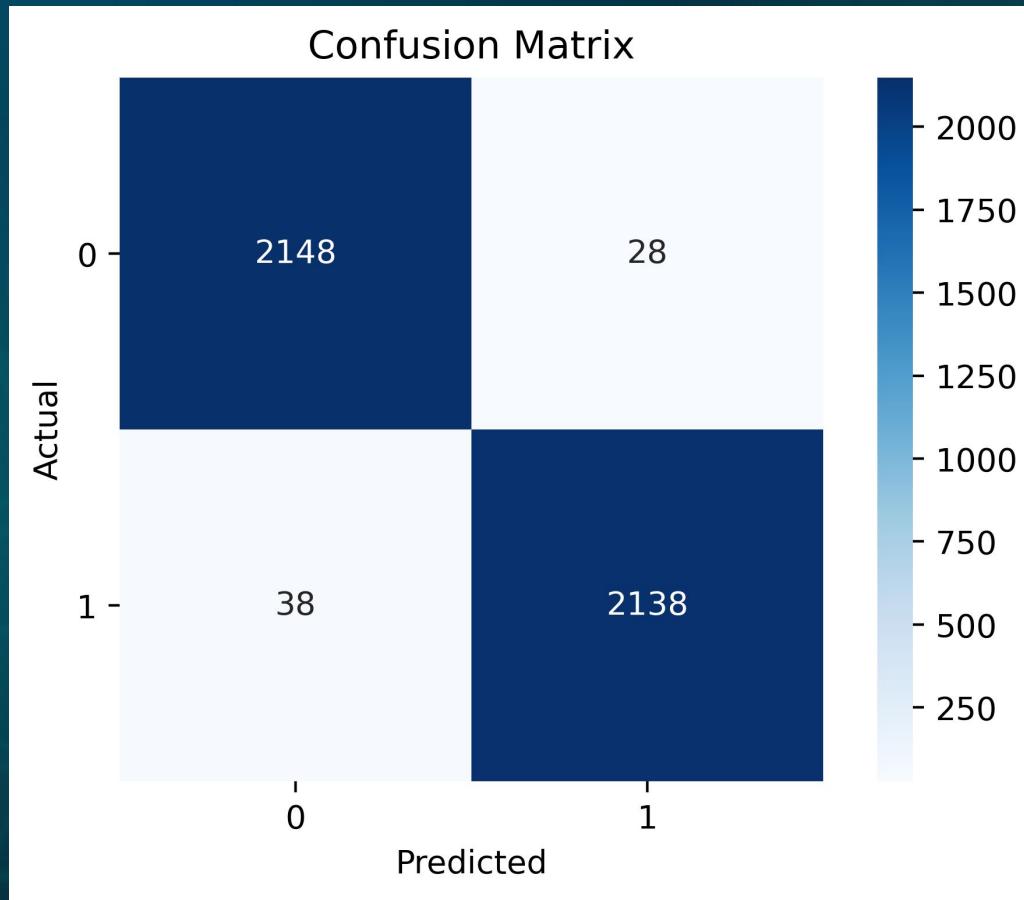
ROC Curve - AUC score = 0.9981



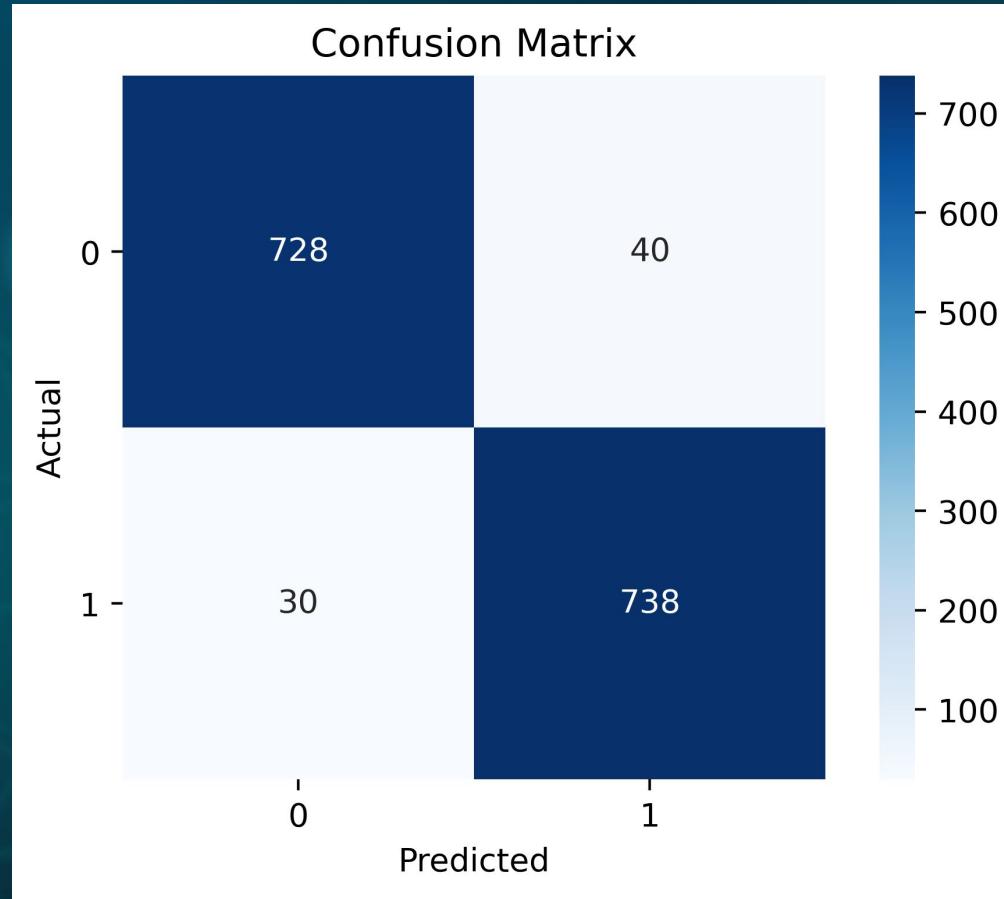
Training Data with 50% Threshold- Accuracy 98.21%



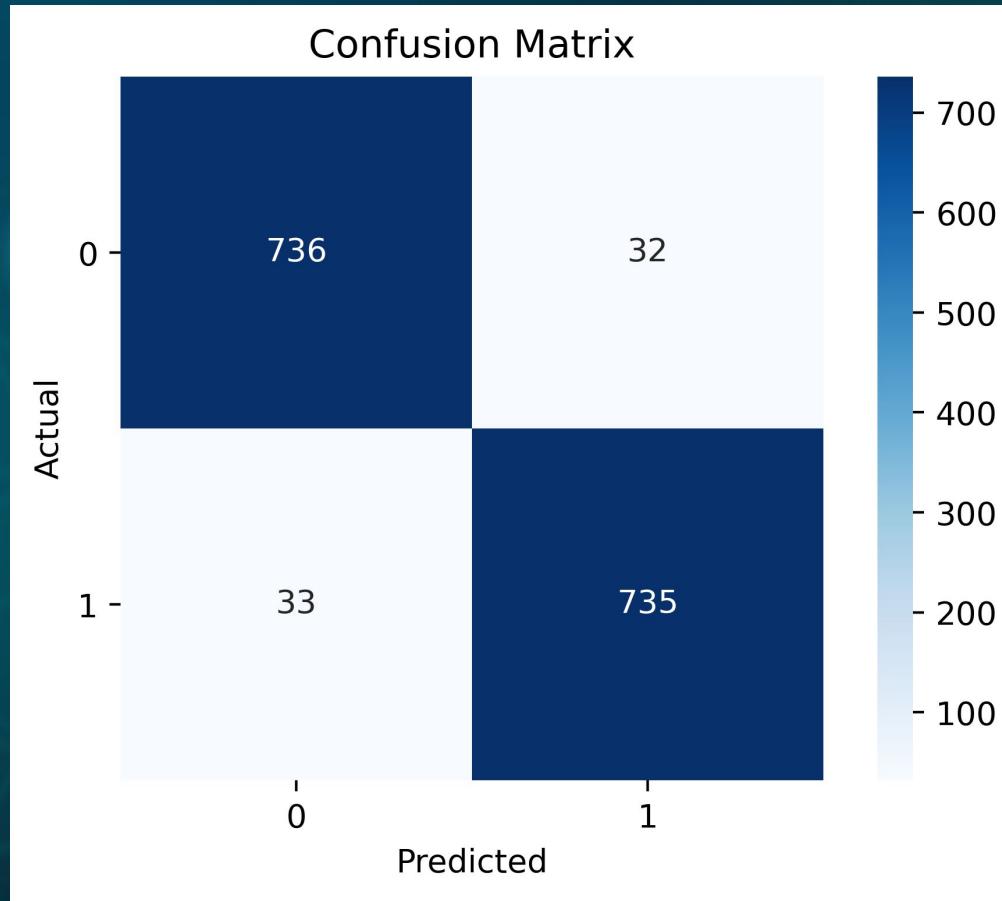
Training Data with 59% Threshold- Accuracy 98.48%



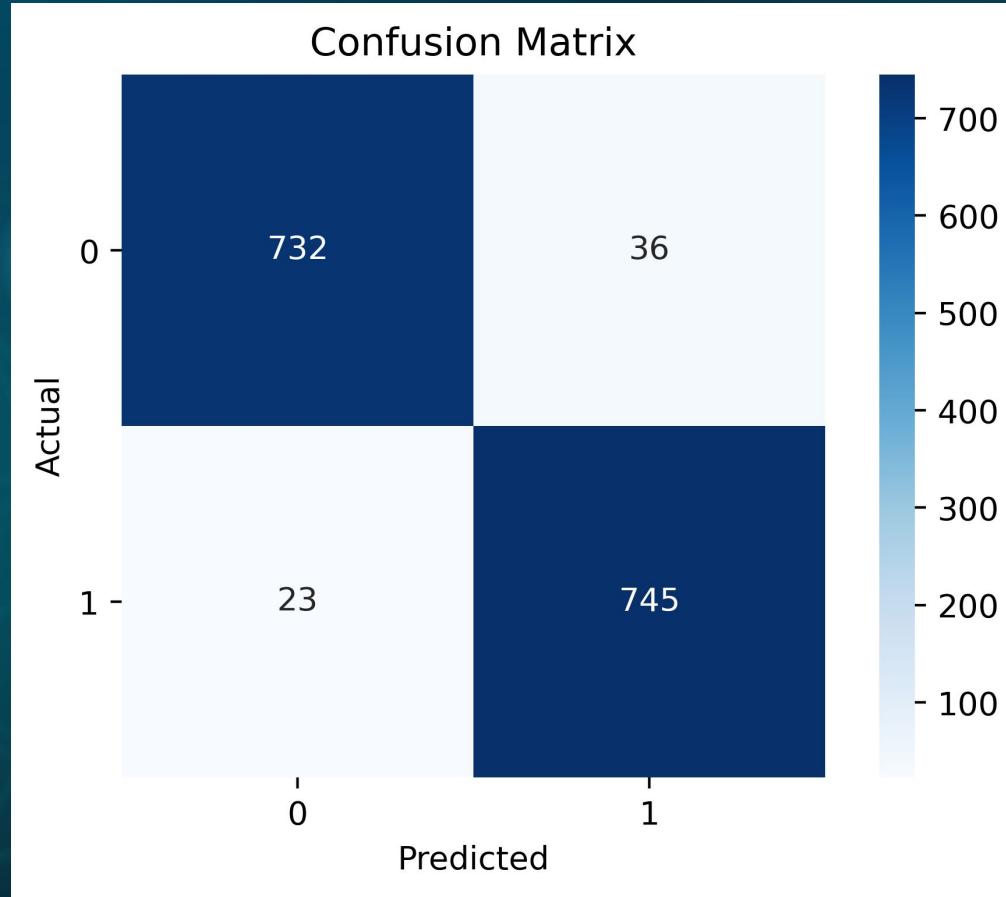
Validation Data with 50% Threshold- Accuracy 95.44%



Validation Data with 59% Threshold- Accuracy 95.77%



Test Result with 50% Threshold- Accuracy 96.16%



Test with Security Camera Images

(0, 0)



(0, 0)



(0, 1)



(1, 1)



(1, 1)



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